

REMARKS

Claims 1, 2 and 4-13 were examined and reported in the Office Action. Claims 1, 2 and 4-13 are rejected. Claim 3 is cancelled. Claims 1 and 11-12 are amended. Claims 1-2, and 4-13 remain.

Applicant requests reconsideration of the application in view of the following remarks.

I. Drawing Objections

It is asserted in the Office Action that the proposed drawings contain new matter and are objected to under 37 CFR §1.83(a). Applicant respectfully disagrees.

Applicant notes that Figure 1 is a continuous electrical waveform of the row function implemented by 2×4 paraunitary matrix. This paraunitary matrix is given as E_1 on page 5 of the specification as originally filed. Figure 2 is an orthogonal block-circulant matrix generated by the building blocks of a 2×8 matrix. In particular, the first order 8 matrix on page 8 (labeled as 1). The generation of the 2×8 matrix into an 8×8 matrix is made according to the definition of the block-circulant technique given on page 3 of the specification as originally filed. Thus, basis for the drawings can be found in the originally filed application. Therefore, no new matter is added. Approval is respectfully requested.

II. Claims Rejected Under 35 U.S.C. §112, first paragraph

It is asserted in the Office Action that claims 1-2 and 4-13 are rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains.

Applicant notes that one of ordinary skill in the art would understand that addressing functions are those of a driving matrix. Applicant notes that support of the claims can be found, for example, on pages 1-2 of the original specification. Page 1 refers to multi-line addressing (MLA). Page 2 asserts that MLA is implemented with

driving matrix (matrices) with diagonal building blocks. Additionally, Applicant has amended claim 1.

Further, it is asserted in the Office Action in paragraph 11 that the limitation "interchanged" is not adequately described in the specification. Applicant notes that claim 5 includes the same limitation as originally filed. A matrix consists of rows and columns as illustrated throughout the original specification. The feature of row and column interchange is an operation that one of ordinary skill in the art can carry out without inventive skill. A row and column interchange is achieved by exchanging or interchanging the entry at a particular location with that in another. A result of row and column interchanges is described on page 4 of the specification and Applicant has indicated that the interchanges can be implemented by using shift registers.

Also, it is asserted in the Office Action that the wording "the row (common) driving matrix consisting of orthogonal block-circulant matrices" is objected to. Applicant notes that an orthogonal block-circulant matrix or matrices can consist of individual block-circulant building blocks. There does not appear to be an inconsistency between claims 6 and 8 and independent claim 1. Further, an explanation can be found on page 3 of the specification. Applicant has provided details of order 4 orthogonal block-circulant building blocks on pages 4, 8 and 9 and details of order 8 orthogonal block-circulant building blocks on pages 9 to 11 of the specification as originally filed. The matrix denoted by 'E' is given on page 5 as a paraunitary matrix. In addition, the structure of a paraunitary matrix is recognizable to one of ordinary skill in the art.

Accordingly, withdrawal of the 35 U.S.C. §112, first paragraph rejection for claims 1-13 are respectfully requested.

III. Claims Rejected Under 35 U.S.C. §112, second paragraph

It is asserted in the Office Action that claims 1-2 and 4-13 are rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant has amended claim 1 to overcome the U.S.C. §112, second paragraph rejection.

Accordingly, withdrawal of the 35 U.S.C. §112, second paragraph rejection for claims 1-2 and 4-13 is respectfully requested.

IV. Claims Rejected Under 35 U.S.C. §102(e)

It is asserted in the Office Action that claims 1, 4 and 6 are rejected under 35 U.S.C. §102(e) as being anticipated by U. S. Patent No. 6,054,972 issued to Otani et al. ("Otani"). Applicant respectfully disagrees.

According to MPEP §2131, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' (Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). 'The identical invention must be shown in as complete detail as is contained in the ... claim.' (Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)). The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required. (In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990))."

Applicant's amended claim 1 contains the limitations of "[a] driving scheme for operation of a liquid crystal display comprising: (i) a plurality of orthogonal addressing functions; (ii) said plurality of orthogonal addressing functions comprising a row (common) driving matrix; (iii) wherein said plurality of addressing functions are applied to a plurality of rows of a display matrix; and (iv) said plurality of orthogonal addressing functions is represented by an orthogonal block-circulant matrix, the orthogonal block-circulant matrix comprising at least one sub-matrix; (v) wherein at least one of said at least one sub-matrix is non-zero and non-orthogonal."

Otani discloses a multi-line addressing driving scheme for an LCD display (see, for example, Otani, column 1, line 32 that asserts selecting "a plurality of scanning lines simultaneously"). The T matrix (Formula 8) of Otani is formed from a small sized matrix (Hadamard matrix S) extended by a Kronecker product (Formula 12). This smaller matrix S is itself, orthogonal. A Kronecker product operation requires placing smaller identical matrices along the diagonal. In Otani the extension of S with a Kronecker product has a repetition of S along the diagonal. The remaining entries of T

are set to zero. The Kronecker product is described in Otani at page 5 and 6. Applicant notes that it is well known in both the field of mathematics and in engineering that placing orthogonal matrices along a diagonal retains an orthogonal matrix.

Distinguishable, a block-circulant matrix as contained in amended claim 1 is arrived at by a repetition of submatrices $A_1 A_2 \dots A_N$ where the submatrices are placed in a circulant fashion. The block-circulant matrix structure is different from a Kronecker product (Formula 12 of Otani). Each submatrix $A_1 A_2 \dots A_N$ is not necessarily itself orthogonal nor of Hadamard form, but in combination the matrices form a large matrix and this large matrix is orthogonal. The resulting orthogonal block-circulant matrix is applied to the address driving scheme of a LCD in the present invention. Thus the orthogonal building blocks (matrix T, Formula S of US Otani) are not the same and do not disclose the "orthogonal block-circulant matrix" of Applicant's claimed invention.

Of further note is that a Hadamard matrix can only exist for certain restricted sizes (a multiple of 4). The class of orthogonal block-circulant matrices, however, is much wider and covers at) paraunitary matrices, of any even size (i.e. 2, 4, 6, 8,...) and contains orthogonal matrices generated by paraunitary matrices in a circulant fashion.

Therefore, since Otani does not disclose, teach or suggest all of Applicant's amended claim 1 limitations, Applicant respectfully asserts that a *prima facie* rejection under 35 U.S.C. §102(e) has not been adequately set forth relative to Otani. Thus, Applicant's amended claim 1 is not anticipated by Otani. Additionally, the claims that directly or indirectly depend from Applicant's amended claim 1, namely claims 4 and 6 (claim 3 being cancelled), are also not anticipated by Otani for the same above reason.

Accordingly, withdrawal of the 35 U.S.C. §102(e) rejection for claims 1, 4 and 6 are respectfully requested.

V. Claims Rejected Under 35 U.S.C. §103(a)

A. It is asserted in the Office Action that claims 2 and 5 are rejected under 35 U.S.C. §103(a) as being unpatentable over Otani in view of Applicant's admitted prior art ("AAPA"). Applicant respectfully disagrees.

According to MPEP §2142 "[t]o establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." (In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). Further, according to MPEP §2143.03, "[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." "All words in a claim must be considered in judging the patentability of that claim against the prior art." (In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970), emphasis added.)

Applicant's claims 2 and 5 depend from Applicant's amended claim 1. Applicant's amended claim 1 is discussed above in view of Otani.

The driving scheme of the Applicant's claimed invention results in advantages over prior art driving schemes, for example the driving scheme of Otani and AAPA. A Kronecker product (e.g. the matrix T of Otani) applied to a multi-line addressing LCD driving scheme results in a number of rows activated simultaneously at any one time being equal to the size of the original smaller matrix (i.e., matrix S of Otani). In Otani, the number of simultaneously activated rows in T is two (the size of S). Using a orthogonal block-circulant matrix driving scheme, however, the number of simultaneously activated rows could be the complete number of rows in the full size of the matrix. A larger number of simultaneously activated rows results in significant improvements in the optical performance of the LCD. For example, reducing flickering

and widening the operating temperature range of the LCD device, especially for high resolution LCDs.

Applicant asserts that Otani does not define or describe a genuine "circulant" matrix as asserted above. A genuine circulant matrix differs from the restricted, Hadamard matrix, as each non-zero sub matrix need not be orthogonal. In contrast the Kronecker product and the Hadamard matrix of Otani are limited to having each sub matrix on the diagonal identical, and specifically each sub matrix in Otani is a Hadamard matrix. Thus, Otani does not disclose a "circulant" matrix and the examples given are only Kronecker products.

Since neither Otani, AAPA, nor the combination of the two teach, disclose or suggest the limitations contained in Applicant's amended claim 1, as listed above, there would not be any motivation to arrive at Applicant's claimed invention. Thus, Applicant's amended claim a is not obvious over Otani in view of AAPA since a *prima facie* case of obviousness has not been met under MPEP §2142. Additionally, the claims that directly or indirectly depend from amended claim 1, namely claims 2 and 5, would also not be obvious over Otani in view of AAPA for the same reason.

Accordingly, withdrawal of the 35 U.S.C. §103(a) rejection for claims 2 and 5 is respectfully requested.

B. It is asserted in the Office Action that claims 8-10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Otani in view of U. S. Patent No. 4,993,075 issued to Sekihara et al. ("Sekihara"). Applicant respectfully disagrees.

Applicant's claim 8 directly depends on amended claim 1. Applicant's claims 9-10 depend on claim 8. Applicant has discussed claim 1 regarding Otani above in section IV and V(A).

Applicant notes that Sekihara is from the field of image processing, which can be considered as a different technological area requiring different knowledge according to a person skilled in the art from that of liquid crystal displays. Although the "non-linear programming" technique has been shown by others (e.g. Sekihara and reference [Nonlinear]) to be a workable and efficient method for image processing, Sekihara uses

a mature non-linear programming technique in the image reconstruction of an NMR image to approximate to the real image.

Applicant asserts that the claimed invention relates to a specific LC display technology and that the non-linear programming calculates and characterizes all orthogonal block-circulant matrices required in the driving scheme. Applicant's method involves finding a set of equations characterizing all orthogonal block-circulant matrices. An ordinary person skilled in non linear programming (an area of analysis in mathematics) but not familiar with matrix theory (an area of algebra) could not be assumed to be able to write down a set of equations characterizing the required orthogonal block-circulant matrices. Applicant asserts that algebra theory and mathematical analysis are two fundamental but different areas of mathematics. Applicant also asserts that knowing one of these does not naturally imply the other.

Further, the set of equations specified by Applicant (described, for example starting on page 8 of the application as originally filed) characterize all orthogonal block-circulant matrices. With Applicant's claimed invention, the equations are converted into a penalty function $P(E)$ and the equations are solved by non linear programming. Thus, all orthogonal block-circulant matrices of any order can be calculated accurately.

Since neither Otani, Sekihara, nor the combination of the two teach, disclose or suggest the limitations contained in Applicant's amended claim 1, as listed above, there would not be any motivation to arrive at Applicant's claimed invention. Thus, Applicant's amended claim 1 is not obvious over Otani in view of Sekihara since a *prima facie* case of obviousness has not been met under MPEP §2142. Additionally, the claims that directly or indirectly depend from amended claim 1, namely claims 8-10, would also not be obvious over Otani in view of Sekihara for the same reason.

Accordingly, withdrawal of the 35 U.S.C. §103(a) rejection for claims 8-10 is respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely 1-2, and 4-13, patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of time fees.

PETITION FOR EXTENSION OF TIME

Per 37 C.F.R. 1.136(a) and in connection with the Office Action mailed on November 10, 2003, Applicant respectfully petitions the Commissioner for a three (3) month extension of time, extending the period for response to May 10, 2004. The Commissioner is hereby authorized to charge payment to Deposit Account No. 02-2666 in the amount of \$950.00 to cover the petition filing fee for a 37 C.F.R. 1.17(a)(2) large entity. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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Dated: May 10, 2004

By: _____

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail with sufficient postage in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22313-1450 on May 10, 2004.

Jean Svoboda